POWER IN A LUMP O'COAL

WORK THAT CAN BE GOT OUT OF A HANDFUL OF BLACK DIAMONDS.

Interesting Calculations Made by Chemists—A Pound Lump Will Accomplish More Than a Hundred Men—Pulls a Heavy Train One-sixth of a Mile.

If you raise 330 pounds 100 feet high in one minute, you have done 33,000 foot-pounds of work in a minute, and this is called one-horse power. When we have weight, distance and time we have the three elements which constitute a measure of work by which two men or two horses or two machines can be compared. This had been done for some time before men began to realize that there was a distinct relation between such units of work and quantities of heat.

Count Rumford first attempted to measure this by determining the quantity of heat which was involved in the boring of a cannon at the arsenal at Munich, Germany. Other observers followed him, and finally adopted what is known as the mechanical equivalent of heat, namely, 778 foot-pounds.

When the chemist wants to determine the power contained in one pound of coal, he simply crushes his coal to a fine powder and takes a small quantity of it, which he carefully weighs, and by chemical means, burns under water. Having previously determined the exact weight and temperature of this water, he finds its temperature after this quantity of coal has been burned in it, and then figures out that if the small pinch of coal which he burnt adds so much temperature to the small quantity of water, a pound of the coal will add a proportionate quantity to a larger weight of water.

Let us, for the purpose of what follows, take a pound of what we will call average coal, containing, say, 10,000 heat units. This would be somewhat smaller in size than a man's fist. If we could burn this pound of coal completely and entirely under water and let all its heat go into the water, we could raise the temperature of 625 pounds of water sixteen degrees.

Picture to yourself that you have a bathtub five feet long, two feet wide, and filled one foot deep with water, and that this water has a temperature of sixty-four degrees. If the pound of coal could be completely burned in that water and all the heat thereby involved could be imparted to this body of water, the later would have become sixteen degrees hotter, i. e., it would be a comfortable bath at eighty degrees Fahrenheit. This does not seem like very much work, but it gives a fair measure of the quantity of heat which slumbers in the lump of coal.

The 10,000 heat units in this one pound of coal which we found sufficient to warm our bath, if expended in mechanical work, would give us 236 horse power. Watt, the father of the modern steam engine, found that a strong brewer's horse could, during eight hours, do work sufficient to raise 330 pounds 100 feet high in one minute, and hence he called this quantity of work performed in this time one horse power. We must remember, however, that the horse will not be raising constantly, for after each hoist the rope and hooks must be again lowered, so that scarce four out of the eight hours are actually spent in the active work of hoisting. We have, therefore, hidden away in this one pound of coal the full day's work of a strong Percheron horse.

The snowfall in winter often seriously impedes travel on city streets, as well as on railways. This has led inventors to study out and patent a number of devices intended to melt away the snow. The fallacy of this mode or proceeding becomes apparent as soon as we figure out what a pound of coal can do in that way. It takes 142 heat units to melt one pound of ice or snow when this ice or snow is already at thirty-two degrees. If it is colder, it will take as many more heat units as are required first to bring the snow to this melting temperature, known as the freezing point. Therefore, when the snow is just ready to melt, the heat in the pound of coal is just sufficient to melt seventy-one pounds of snow. This is less than one-third of an ordinary cart load. But we have just seen that this pound of coal carries within it the power of 236 horses, each of which could easily pull thirty times as much snow, if loaded in a wagon, as this one pound of coal can melt.

Again, the 236 horse power of potential energy which we know to be slumbering in this pound of coal would do the work of an express locomotive for one-fifth of a minute. In other words, it is enough to haul a train of eight cars, including Pullman sleeping cars and dining cars, at the rate of fifty miles an hour one-sixth of a mile. It is enough to haul a train at the rate of nine miles an hour, including the grip car, the trailer, and its quotum of moving cable, a distance of nearly two miles; and it is enough also to pull an electric motor car, loaded with passengers, at the rate of ten miles an hour, two and one-half miles.

Let us now compare the power imprisoned in this black diamond with the work of a strong man accustomed to hard labor. Many observations show that such a man can do, on an average, about one-tenth of a horse power. Allow him eight working hours, equal to 480 minutes. During this time he occasionally stops for short rests, to change his position, to pick up another tool, to judge of the result of his work and to plan for further procedure. This will easily consume one-tenth of the time, leaving 432 minutes, which, at one-tenth of a horse power gives him a total effect of 43.2 horse power as the result of his day's labor. This pound of coal contains more than sufficient power to d in one minute the day's work of five such strong men. Or it would take about 2600 strong men, working steadily side by side, to do jointly as much work in one minute as nature has locked up for us, ready at our call, in a single pound of coal.

An exceptionally strong man has been known to do one-half horse power of work as his mightiest effort, but in two and a half minutes' work at this rate he exhausts his muscular force. Let us suppose 100 such men putting forth such extreme effort at rope, or crank or crowbar; as they fall back, red-faced and puffing, to catch their breaths, we might imagine this little black lump saying to them: "I can do as much as your whole company, and then can stand it for fully two minutes longer before I am exhausted!"

In sawing wood, a man may work at the rate of about sixty strokes a minute and consider himself a "top-sawyer," and his saw blade may have progressed five feet a minute, but a circular saw, driven by machinery, may be put through seventy times that distance and saw seventy times as much wood. And yet this one little pound of coal contains power enough for 180 such saws.

Scouting in Africa.

We know of no higher trial to the nerves than to ride alone toward some kopje which may possibly be held by the enemy, yet such is the daily and hourly task of scores of our young soldiers. At a thousand yards from the hill, you view it with equanimity, for although a Mauser bullet can be intensely disagreeable at 1000 yards, a single mounted man can usually approach to within half that distance without much risk. But as you near the hill you cannot help feeling that, likely enough, sharp eyes are carefully watching your approach and that their owners are only waiting until they can be reasonably certain of scoring a good hit—you being the target. Nearer and nearer you draw, either to find that your anxiety had been groundless and that the kopje is not held—or to be suddenly greeted with a cloud of dust and small stones as the spiteful bullets patter all round—let us hope without harm—and you turn and ride for your life amid a shower of shot and with the information that the kopje is certainly occupied!—The Gentleman's Magazine.

Side-Lights on Life.

A cynical woman says that when a man breaks his heart it is the same as when a lobster breaks one of his claws—another sprouts immediately and grows in its place.

The father of a bright baby can readily believe that smartness is hereditary.

It is said that brains will tell, but sometimes the more brains a man has the less he tells.

Never judge a man by the clothes he wears; judge him by the amount he owes the tailor.

The more a man has the more he wants—with the possible exception of twins.

It's a good thing that man wants but little here below, for woman wants the balance.

It sometimes happens that the man who knows his own mind doesn't know much after all.

Every time a man invents a good scheme some other fellow comes along and makes a fortune out of it.

The only thing original about the average joke is the sin of stealing it.—Chicago News.

Burst an Artery Washing His Face.

Because George Fisher, a Lehigh Valley freight handler, washed his face rather vigorously a few days ago before breakfast, he came near bleeding to death. He was rubbing the skin under his left eye, when suddenly he felt a warm stream running down his face, and in an instant discovered that it was blood. The red fluid spurted out in such volume that Fisher became alarmed when he found himself powerless to check the flow. A carriage was hastily summoned, and he was rapidly driven to the Fitch Hospital. When he arrived there he was weak and was fairly drenched with blood.

The surgeons discovered that he was suffering from a spontaneous rupture of the infraorbital artery, which is situated just below the eye. The ends of the artery were gathered up and rejoined.—Buffalo Evening News.

Advice to Sneezers.

Never turn your head when you sneeze, or you may rupture a blood vessel in the brain and go off as did good Mr. Samuel Halper, of Derby. Most persons do their sneezing at the dinner table, after vigorously peppering their food. They should push back their chairs when they feel the emotion coming on and turn their bodies away with their heads. To twist the head around is to compress certain muscles, veins and arteries. I have known two men to die sneezing. In ancient days it was not unusual to see healthy citizens drop dead in the street in the midst of this involuntary convulsive action. Hence "Jupiter help me" and "God bless you."—Victor Smith, in New York Press.

Her Disappointment.

It is the dead of night. That is not another story; understand.

With straining ears the woman listens.

She hears her husband enter the house and walk swiftly through the parlor.

"Ah, me!" she sighs. "He has knocked nothing over! The room is not yet artistically furnished!"

She cries softly to herself awhile; and then resolves upon the morrow to buy a few additional loads of bric-a-brac and try anew.—Detroit Journal.

POPULAR SCIENCE.

Birds can be colored, according to Dr. Sauermann, an Austrian, by supplying them with food dyed with aniline. He obtained pigeons of a beautiful red and others of a fine blue. He does not say what the effect of the aniline is on the health of the birds. Basic aniline in doses of ten drops is a poison, but the aniline dyes being in an oxydized form have been pronounced harmless. Indeed they are now widely used in coloring candies and the likes.

Lead poisoning may be more common than is supposed. So thinks a French physician, who was puzzled by the colic and constipation of a boy of twelve until the father appeared with the same trouble, when it was discovered that the family had been using kindling wood from a white lead factory. A case in a young woman was traced to the sheet leader wrapper of her snuff. Another case showed typical symptoms, but the course of the poison could not be detected.

Dr. Grassi, an Austrian physiologist, declares that the human brain contains a "name centre" cell, the office of which is to retain names. He mentions a curious confirmation of his theory. The guard of an Austrian train was shot in a quarrel, and when he became conscious was entirely unable to remember the names of persons or things. The surgeon probed for the bullet, and found it at the exact spot on the brain's surface which Dr. Grassi identifies with the name cell. When the pressure on the brain had been relieved the patient remembered names as well as he had done before, and told the name of his assailant.

From the study of clouds Professor F. H. Bigelow, of the United States Weather Bureau, concludes that the ordinary cyclones which traverse our country from west to east are not more than two or three miles in depth, although their diameter is many hundreds of miles. In other words, their motion does not affect the upper regions of the atmosphere. In the case of hurricanes Professor Bigelow finds that the depth is greater, amounting to as much as five or six miles. But the higher currents blow directly across the cyclonic and anticyclonic areas which produce storms and fair weather at the surface of the earth. Some of Professor Bigelow's conclusions upset former ideas concerning the circulation of the atmosphere.

Professor Holsti, of Helsingfors University, Finland, has been gathering statistics of tuberculosis for eight years. The belief used to be that this disease exhibited itself most fatally between the ages of fifteen and thirty years. The figures show, however, that the mortality rate is much the greater in infancy, during the first two years of life. It is then 2.5 per cent.; from that age it rapidly falls till at fifteen it hardly exists; and it then gradually rises again. Males are more susceptible than females. The fact that the disease is several times more fatal during the first two years of life, or the time when children are fed exclusively on milk, is taken to suggest that the cow's milk may be the chief source of infection. The history of Japan, which is a cowless country, favors this view in a measure.

The Balloon in War.

The position that a balloon must occupy to insure the complete safety of its staff has been quite accurately determined by experiments. It is evident that there are two factors—elevation and distance. In round numbers it may be said that a balloon is absolutely safe at a distance of four miles and at a height of 2000 feet. With every mile that the balloon is brought nearer to the enemy's batteries it is necessary to materially increase the height of the balloon. English artillerists fired without effect twelve rounds of shrapnel at a balloon distant about 3000 yards and at a height constantly varying from 1200 to 1500 feet. Under wind conditions favorable to the gun, it required sixteen rounds of shrapnel to hit a balloon distant 3500 yards and at an elevation of 1700 feet. The Germans practised with shrapnel at Cummensdorf on two balloons distant three miles; the first, at an elevation of 300 feet, fell pierced in some twenty-five places after ten shots, but the second balloon, at an elevation of 500 feet, was disabled only after twenty discharges. French experiments at Poitiers prove that neither artillery nor mitrailleuse fire can affect a balloon at a moderate elevation and distant more than 5500 metres (three and one-third miles). Even at distances of one or two miles it requires considerable time and effort to get the range of a balloon, which should be frequently raised and lowered and changed from place to place when within easy range.—General Greely, in Harper's Magazine for June.

Biggest Match Factory.

The Vulcan Match Factory, at Tidaholm, Sweden, employs over 1200 men, and manufactures daily 900,000 boxes of matches. The yearly output requires 600,000 cubic feet of wood, 250,000 pounds of paper and 40,000 pounds of rye flour for pasting the boxes. Three hundred of the most complete and ingenious pieces of machinery, all of Swedish invention, are used in this factory.

An Easy Explanation.

This adventure with the Micmac Indians reminds me of a friend who once bought some baskets from one at Cape Breton. On his return to England the baskets were sold at a bazaar, and he heard the fair vendor describe them as being made by the "Nicknack Indians, so called from their skill in the manufacture of basket ware."